

CLAIMS:

1. A method for detecting a desired signal in an
electromagnetically noisy environment, the method
5 comprising:

detecting electromagnetic signals comprising a noise
signal and the desired signal;

compressing the detected electromagnetic signals to
generate a compressed signal;

10 filtering the compressed signal to generate a
filtered signal comprising substantially the desired
signal; and

expanding the filtered signal.

2. The method of Claim 1 wherein the desired
15 signal is a known signal.

3. The method of Claim 1 wherein the desired
signal is a signal on a metallic conductor.

4. The method of Claim 1 wherein the step of
detecting electromagnetic signals is performed by a first
20 antenna, and wherein the method further comprises:

detecting with a second antenna electromagnetic
signals comprising substantially the noise signal; and

inverting the noise signal detected by the second
antenna, and summing the inverted signal to the signal
25 detected by the first antenna for the step of
compressing.

5. The method of Claim 1 further comprising the step of amplifying the compressed signal.

6. The method of Claim 1 further comprising the step of generating an audible sound indicative of the expanded signal.

7. The method of Claim 1 wherein the filter is a first filter, and wherein the method further comprises controlling whether the compressed signal is directed through the first filter or through a second filter connected in parallel with the first filter and expander.

8. An apparatus for detecting a desired signal in electromagnetically noisy environments, the apparatus comprising:

an antenna configured to detect electromagnetic signals comprising a noise signal and the desired signal;

an electronic signal compressor electrically connected to the antenna and configured for compressing the electromagnetic signals to thereby generate a compressed signal;

a bandpass filter connected to the compressor for receiving the compressed signal from the compressor and configured for generating a filtered signal comprising substantially the desired signal; and

an electronic signal expander connected to the bandpass filter and configured for expanding the filtered signal.

9. The method of Claim 8 wherein the desired signal is a known signal.

10. The method of Claim 8 wherein the desired signal is a signal on a metallic conductor.

5 11. The apparatus of Claim 8 wherein the antenna is a first antenna, and the apparatus further comprises:

a second antenna configured for detecting electromagnetic signals comprising substantially the noise signal; and

10 an amplifier connected to the compressor, first antenna, and second antenna, the amplifier being configured for inverting the signal detected by the second antenna, and summing the inverted signal to the signal detected by the first antenna.

15 12. The apparatus of Claim 8 wherein the antenna is a first antenna, and the apparatus further comprises:

a second antenna configured for detecting electromagnetic signals comprising substantially the noise signal; and

20 a differential amplifier connected to the compressor, first antenna, and second antenna, the amplifier being configured for inverting the signal detected by the second antenna, and summing the inverted signal to the signal detected by the first antenna.

25 13. The apparatus of Claim 8 further comprising a gain controller configured for adjusting amplitude of the compressed signal.

14. The apparatus of Claim 8 further comprising an amplifier and speaker connected to the expander for generating an audible sound indicative of the expanded signal.

5 15. The apparatus of Claim 8 further comprising a tick generator connected to a speaker, the tick generator being configured for periodically generating a tick signal for output through the speaker to indicate that the apparatus is powered on and in a mode of operation.

10 16. The apparatus of Claim 8 wherein the bandpass filter is a first bandpass filter, and wherein the apparatus further comprises:

 a second bandpass filter connected in parallel with the first bandpass filter and expander; and

15 means for controlling whether the compressed signal is directed through the first bandpass filter or the second bandpass filter.

20 17. An apparatus for detecting a signal in an electromagnetically noisy environment, the apparatus comprising:

 a probe antenna configured to detect electromagnetic signals comprising a noise signal and the tone signal;

 a noise canceling antenna configured for detecting electromagnetic signals comprising substantially the
25 noise signal;

 an amplifier connected probe antenna and noise canceling antenna, the amplifier being configured for inverting the signal detected by the noise canceling

antenna, and outputting an amplified signal comprising the sum of the inverted signal and the signal detected by the probe antenna;

an electronic signal compressor electrically
5 connected to the amplifier for receiving the amplified signal, and configured for compressing the amplified signal to thereby generate a compressed signal;

a bandpass filter connected to the compressor for receiving the compressed signal from the compressor and
10 for substantially filtering out the noise signal and outputting a filtered signal comprising substantially the known signal and insubstantially the noise signal;

an electronic signal expander connected to the bandpass filter and configured for receiving the filtered
15 signal and generating an expanded signal comprising substantially the known signal amplifying and attenuating substantially the noise signal of the filtered signal; and

a speaker connected to the expander for generating
20 an audible sound indicative of the expanded signal.

18. The method of Claim 17 wherein the known signal is a known signal on a wire.

19. The apparatus of Claim 17 wherein the amplifier is a differential amplifier.

25 20. The apparatus of Claim 17 further comprising a gain controller interconnected between the compressor and bandpass filter and configured for adjusting the amplitude of the compressed signal.

21. The apparatus of Claim 17 further comprising a tick generator connected to a speaker, the tick generator being configured for periodically generating a tick signal, and the speaker being configured for making the tick signal audible to indicate that the apparatus is powered on and operating in a mode of operation utilizing an expander.

22. The apparatus of Claim 17 wherein the bandpass filter is a first bandpass filter, and wherein the apparatus further comprises:

a second bandpass filter connected in parallel with the first bandpass filter and expander; and

means for controlling whether the compressed signal is directed through the first bandpass filter or the second bandpass filter.

23. A method for detecting a desired signal in an electromagnetically noisy environment, the method comprising:

detecting electromagnetic signals comprising a noise signal and the desired signal;

compressing the detected electromagnetic signals to generate a compressed signal;

filtering the compressed signal to generate a filtered signal comprising substantially the desired signal.

24. The method of Claim 23 wherein the desired signal is a known signal.

25. The method of Claim 23 wherein the desired signal is a signal on a metallic conductor.

26. The method of Claim 23 wherein the step of detecting electromagnetic signals is performed by a first antenna, and wherein the method further comprises:

detecting with a second antenna electromagnetic signals comprising substantially the noise signal; and

inverting the noise signal detected by the second antenna, and summing the inverted signal to the signal detected by the first antenna for the step of compressing.

27. The method of Claim 23 wherein the filter is a first filter, and wherein the method further comprises controlling whether the compressed signal is directed through the first filter or through a second filter connected in parallel with the first filter.

28. A method for detecting a desired signal in an electromagnetically noisy environment, the method comprising:

detecting electromagnetic signals comprising a noise signal and the desired signal;

filtering the detected electromagnetic signals to generate a filtered signal comprising substantially the desired signal; and

expanding the filtered signal.

29. The method of Claim 28 wherein the desired signal is a known signal.

30. The method of Claim 28 wherein the desired signal is a signal on a metallic conductor.

31. The method of Claim 28 wherein the step of detecting electromagnetic signals is performed by a first antenna, and wherein the method further comprises:

detecting with a second antenna electromagnetic signals comprising substantially the noise signal; and

inverting the noise signal detected by the second antenna, and summing the inverted signal to the signal detected by the first antenna for the step of filtering.

32. The method of Claim 28 wherein the filter is a first filter, and wherein the method further comprises controlling whether the compressed signal is directed through the first filter or through a second filter connected in parallel with the first filter.

33. A method for detecting a desired signal in an electromagnetically noisy environment, the method comprising:

detecting with a first antenna electromagnetic signals comprising a noise signal and the desired signal;

detecting with a second antenna electromagnetic signals comprising substantially the noise signal; and

inverting the noise signal detected by the second antenna, and summing the inverted signal to the signal detected by the first antenna to generate a summed signal.

34. The method of Claim 33, further comprising:
compressing the summed signal to generate a
compressed signal;

5 filtering the compressed signal to generate a
filtered signal comprising substantially the desired
signal; and

expanding the filtered signal.

35. The method of Claim 33, further comprising:
filtering the summed signal to generate a filtered
10 signal comprising substantially the desired signal; and
expanding the filtered signal.

36. The method of Claim 33, further comprising:
compressing the summed signal to generate a
compressed signal; and
15 filtering the compressed signal to generate a
filtered signal comprising substantially the desired
signal.

37. The method of Claim 33, further comprising:
compressing the summed signal using digital signal
20 processing (DSP) to generate a compressed signal;
filtering the compressed signal using DSP to
generate a filtered signal comprising substantially the
desired signal; and
expanding the filtered signal using DSP.

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38. The method of Claim 33, further comprising:
filtering the summed signal using digital signal
processing (DSP) to generate a filtered signal comprising
substantially the desired signal; and
5 expanding the filtered signal using DSP.

39. The method of Claim 33, further comprising:
compressing the summed signal using digital signal
processing (DSP) to generate a compressed signal; and
filtering the compressed signal using DSP to
10 generate a filtered signal comprising substantially the
desired signal.

40. The method of Claim 33 wherein the desired
signal is a known signal.

41. The method of Claim 33 wherein the desired
15 signal is a signal on a metallic conductor.

42. A method for detecting a desired signal in an
electromagnetically noisy environment, the method
comprising:

detecting electromagnetic analog signal comprising a
20 noise signal and the desired signal;

converting the analog signal into a digital signal;

compressing the digital signal using digital signal
processing (DSP) to generate a compressed signal;

filtering the compressed signal using DSP to
25 generate a filtered signal comprising substantially the
desired signal;

expanding the filtered signal using DSP to generate an expanded digital signal; and

converting the expanded digital signal to an analog signal.

5 43. The method of Claim 42 wherein the desired signal is a known signal.

44. The method of Claim 42 wherein the desired signal is a signal on a metallic conductor.

10 45. The method of Claim 42 wherein the step of detecting electromagnetic signals is performed by a first antenna, and wherein the method further comprises:

detecting with a second antenna electromagnetic signals comprising substantially the noise signal; and

15 inverting the noise signal detected by the second antenna, and summing the inverted signal to the signal detected by the first antenna for the step of compressing.

46. The method of Claim 42 further comprising the step of amplifying the compressed signal.

20 47. The method of Claim 42 further comprising the step of generating an audible sound indicative of the expanded signal.

48. The method of Claim 42 wherein the filter is a first filter, and wherein the method further comprises controlling whether the compressed signal is directed through the first filter or through a second filter
5 connected in parallel with the first filter and expander.

49. A method for detecting a desired signal in an electromagnetically noisy environment, the method comprising:

detecting electromagnetic analog signals comprising
10 a noise signal and the desired signal;

converting the analog signals into a digital signal;

compressing the digital signal using digital signal processing (DSP) to generate a compressed signal;

filtering the compressed signal using DSP to
15 generate a filtered signal comprising substantially the desired signal.

50. The method of Claim 49 wherein the desired signal is a known signal.

51. The method of Claim 49 wherein the desired
20 signal is a signal on a metallic conductor.

52. The method of Claim 49 wherein the step of detecting electromagnetic analog signals is performed by a first antenna, and wherein the method further comprises:

25 detecting with a second antenna electromagnetic analog signals comprising substantially the noise signal; and

inverting the noise signal detected by the second antenna, and summing the inverted signal to the signal detected by the first antenna for the step of compressing.

5 53. The method of Claim 49 wherein the filter is a first filter, and wherein the method further comprises controlling whether the compressed signal is directed through the first filter or through a second filter connected in parallel with the first filter.

10 54. A method for detecting a desired signal in an electromagnetically noisy environment, the method comprising:

detecting electromagnetic analog signals comprising a noise signal and the desired signal;

15 converting the analog signals into a digital signal;
filtering the digital signal using digital signal processing (DSP) to generate a filtered signal comprising substantially the desired signal; and

expanding the filtered signal using DSP.

20 55. The method of Claim 54 wherein the desired signal is a known signal.

56. The method of Claim 54 wherein the desired signal is a signal on a metallic conductor.

25 57. The method of Claim 54 wherein the step of detecting electromagnetic signals is performed by a first antenna, and wherein the method further comprises:

detecting with a second antenna electromagnetic signals comprising substantially the noise signal; and

inverting the noise signal detected by the second antenna, and summing the inverted signal to the signal
5 detected by the first antenna for the step of filtering.

58. The method of Claim 54 wherein the filter is a first filter, and wherein the method further comprises controlling whether the compressed signal is directed through the first filter or through a second filter
10 connected in parallel with the first filter.

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